

## 9.2

## Building Commissioning

Building commissioning involves documenting the owner's goals and needs for a facility and then ensuring that those goals are being met. In large, complex facilities, effective commissioning can help ensure that all performance goals are met, often resulting in a showcase facility. Commissioning may be limited to specific systems, such as HVAC or building automation, or it may cover the entire project. Commissioning traditionally involves comprehensive testing of an existing facility or a new facility after construction is completed, simulating a complete range of outside conditions and operating modes to verify performance. More recently, however, the involvement of commissioning agents or authorities has extended from the predesign into the post-occupancy phases of the project.

## Opportunities

Some degree of commissioning is worthwhile in nearly every project, though the importance of commissioning increases as facilities get more complex or experience higher demands on mechanical and electrical systems. Large, mixed-use facilities are important commissioning targets, as are those with laboratories, assembly halls, and other large ventilation loads. Buildings in hot and humid climates or very cold climates are especially susceptible to serious problems if they are not properly commissioned. Facilities that are experiencing comfort problems, excessive energy use, or premature deterioration are high-priority commissioning targets. Within a new or existing facility, any systems that have historically been troublesome to O&M staff in similar facilities should be targeted for specific attention during commissioning.

The earlier in the design process it begins, the better are the chances that commissioning will be an integral and effective part of the design and construction process. The opportunities for the designer are many and include defining a holistic approach to sustainable design that includes energy efficiency, environmental pollution prevention, and economic cost-effectiveness from a life-cycle cost viewpoint. The scope of work for the building commissioning should be integrated into the project's goals for performance, quality control, and innovations.

*Recommissioning* is recommended periodically during the operation of a building—just as periodic tune-ups are recommended for automobiles. A good time to carry out recommissioning is during any renovation work, during tenant changeover, or during periods of light usage—such as during the summer for school facilities.

## Technical Information

Good commissioning agents are professionals with broad expertise and the training to look at buildings as complex, interconnected systems. When they participate throughout an entire design process, they can offer invaluable suggestions, not only for avoiding problems but also for exploiting potential synergies between different building systems to optimize performance at least cost. If the commissioning agents are versed in the strategies and technologies of sustainable design, they may be well positioned to monitor and document the compliance of a facility with the requirements of a green building rating system, such as LEED™ (Leadership in Energy and Environmental Design) from the U.S. Green Building Council.

A commissioning agent or authority may be hired by the owner as an autonomous agent working alongside the designers and contractors, or commissioning may be contracted as an additional service from a design-build or construction management provider. Regardless of the specific contractual arrangements, provisions must be made with other participants in the design and construction process to facilitate their cooperation with the commissioning process. A-E firms and contractors must be paid for their time and effort to produce timely and complete documentation and to resolve any concerns that are raised during the commissioning process. Ideally, these arrangements should be spelled out before the design phase begins, so that the lines of communication are clear.

### COSTS OF COMMISSIONING, NEW CONSTRUCTION

Commissioning Scope	Cost
All Mechanical and Electrical Building Systems	0.5–1.5% of total construction cost
HVAC and Automated Control Systems	1.5–2.5% of mechanical system cost
Electrical Systems Commissioning	1.0–1.5% of electrical system cost
Energy-Efficiency Measures	\$0.23–0.28/ft <sup>2</sup> (\$2.48–\$3.01/m <sup>2</sup> )
Source: Portland Energy Conservation Inc., as published in <i>Building Commissioning Guide</i> version 2.2 from the U.S. General Services Administration and the U.S. Department of Energy, July 30, 1998.	



Source: Portland Energy Conservation, Inc.

*During the commissioning of a new facility, the agents discovered that this outdoor photocell controlling the exterior and parking lot lighting had been sprayed with paint and did not function properly.*

Conventional testing, adjusting, and balancing (TAB) that is typically performed on newly installed HVAC systems is not a substitute for comprehensive commissioning. TAB merely checks and adjusts flows under standard conditions; it does not thoroughly test the systems under all projected operating conditions, nor does it check that the systems as designed and installed will satisfy the owner's requirements for the space.

Sophisticated computer modeling is increasingly able to describe the conditions that equipment and systems *should* be creating, which then simplifies on-site verification efforts. One such tool, the Information Monitoring and Diagnostic System, is currently being tested by researchers at Lawrence Berkeley National Laboratory.



The economics of commissioning are very favorable. In an existing facility, commissioning and then resolving problems usually has a simple payback of a year or less in energy savings alone. In new construction, commissioning helps bring projects in on schedule and within budget without sacrificing quality or performance. The earlier commissioning begins (in the design and construction process), the greater the benefits tend to be. Commissioning can also save money by avoiding unnecessary redesigns, contractor requests-for-information, and contractor callbacks.

Building on the success and insights of commissioning during design and construction, the practices of *continuous building commissioning* and *recommissioning* are gaining popularity. Continuous commissioning involves ongoing monitoring and testing of systems as part of a regular maintenance plan to ensure optimum performance and enhance longevity. Recommissioning is a less regular examination of building operations that is similar to the initial commissioning that follows building completion. Both procedures are attempts to keep buildings operating as they were designed.



When commissioning an existing facility or a new facility after construction, people responsible for O&M should be included in the process. In existing facilities, they may have knowledge about undocumented problems and modifications. In both existing and new facilities, testing the systems through all conditions and performance parameters is an excellent training opportunity for O&M staff. If staff are unavailable or frequent turnover is likely, key aspects of the commissioning process should be captured on videotape as a training resource.

## References

Heinz, John, P.E., *Building Commissioning Handbook*, APPA Publications, Alexandria, VA, 1996; (703) 549-2772.

Odom, J. David, and George DuBose, *Commissioning Buildings in Hot, Humid Climates*, September 1999, CH2M-HILL, Inc., Orlando, FL; (407) 423-0030.

DOE FEMP/GSA Building Commissioning Guidelines; [www.eren.doe.gov/femp/techassist/bldguide.pdf](http://www.eren.doe.gov/femp/techassist/bldguide.pdf).

## Contacts

Building Commissioning Association, P.O. Box 158, La Conner, WA 98257; (360) 466-5611; [www.bcx.org](http://www.bcx.org).

Florida Design Initiative, Total Building Commissioning Web site: [sustainable.state.fl.us/fdi/edesign/resource/totalbcx/index.html](http://sustainable.state.fl.us/fdi/edesign/resource/totalbcx/index.html).

Portland Energy Conservation, Inc., 921 SW Washington, Suite 312, Portland, OR 97205; (503) 248-4636; [www.peci.org](http://www.peci.org).